Modeling PCBs: Lessons Learned from Large Systems

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Abstract

Marine ecosystems are complex and many researchers work on only limited niches. Models help to create pictures of the larger process. In Puget Sound and Georgia Basin (PS/GB) key questions are: Why such high levels of PCBs in Orcas? Where are the PCBs coming from? What can we do to start reducing the levels? Models can help answer these questions. For example, measured PCB concentration data in biota are generally within a factor of 2.5 of model predictions.

Mass balance models developed elsewhere (e.g., Kittimat Arm, Burrard Inlet, Great Lakes and tributaries) provide a series of lessons learned that can be applied to PS/GB. These include:

1. Start simple and recognize the tradeoffs with complexity (model input requirements need not be large).
2. Recognize disequilibrium (imbalances "force" chemicals through the benthic foodweb).
3. Understand the role of organic carbon mineralization.
4. Model at the system and organism level.

With respect to PCBs:

1. PCB toxicity to vertebrates is mostly AhReceptor-mediated (producing dioxin-like effects).
2. Measure concentrations of PCBs in tissues or diet (to link exposure with effects).
3. Know critical residue values.
4. Understand the management goals.

An important question for GB/PS is how to evaluate non-resident species?